Neuroprognostication after cardiac arrest

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Set the scene ...
• 55 yo man, found collapsed in park, looks like he’d been jogging, no pulse, bystander CPR, ambulance arrives 5 mins later, VF, 3x shock, 2x adrenaline, ROSC

• In ED, SBP 200mHg, pH 7.25, pupils dilated and unresponsive, GCS 3, cooled to 36° for 24 hours

• 24 hours remains unconscious 4 hours after sedation ceased

• What would you advise regarding his prognosis?
Cardiac arrest

- 15,000 per year have cardiac arrest in Oz
- 80% occur at home with 90% mortality
- ~10% survive 1 year
- 50% survivors have permanent brain damage
- Rates haven’t really changed over 3 decades
Overview

Prognosis involves consideration of …

• Underlying cause
• Co-morbidities
• Targeted temperature
• Features of cardiac arrest
• Cardiovascular assessment
• Neurological assessment
Facts to consider

- ICU doctors overestimate poor outcomes
- ICU doctors underestimate good outcomes
- Applies especially when first day in ICU
- Withdrawal of life support is self-fulfilling
- Families express doubt about prognostic accuracy of ICU doctors

Rocker et al, CCM (2014), Young, NEJM (2009)
The dilemma ...

- Prognosis in comatose ICU patients is needed to guide fellow physicians and families.
- ‘Expert’ opinion can have a great influence.
- Getting it wrong can be disastrous.
The issues

• Prediction is never 100% accurate
• What level is acceptable?
• What level of outcome is not worthy of continued support?
Features of cardiac arrest

- Witnessed arrest
- Downtime $< 10$ mins
- Bystander CPR
- Delay in CPR
- Shockable rhythm better
- Time to ROSC
- Age / co-mobidities / pre-morbid function
MILD THERAPEUTIC HYPOTHERMIA TO IMPROVE THE NEUROLOGIC OUTCOME AFTER CARDIAC ARREST

THE HYPOTHERMIA AFTER CARDIAC ARREST STUDY GROUP*

INDUCED HYPOTHERMIA AFTER OUT-OF-HOSPITAL CARDIAC ARREST

TREATMENT OF COMATOSE SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST WITH INDUCED HYPOTHERMIA

Therapeutic hypothermia

- 2 earlier trials, 32 or 33 degrees, associated with improved neurological outcomes.
- Recent trial (TTM trial) = standardised protocol to guide decision making (Nielsen et al, 2013)
  - 36 degrees for first 24 hours
  - Active tmt for 72 hours (unless severe myoclonus, brain death or ethical reasons)
Nepean ICU protocol

Consider whether ICU is appropriate
  Initial stabilisation
  Consider revascularisation

Reduce and maintain body temperature at 36 degrees

Passive rewarming

Prevent fever > 37.5 degrees

Work out prognosis
Cardiovascular status

- Severe cardiogenic shock post PCI
- NSTEMI vs ST elevation
- EF post procedure
- Successful revascularisation
Neurological assessment

• Best motor response at 72 hours
• Pupil response at 72 hours
• Corneal response at 72 hours
• Myoclonic status epilepticus
  • Generalised and repetitive vs single seizure and sporadic myoclonus
A challenging component for me …

**MYOCLONUS**

- Original paper - Levy, D JAMA 1985
  - 90% poor neurological outcome
- Two subsequent series
  - Wijdicks (Ann Neurol 1994) / Young (Neurol 1990)
  - Am Assos Neuro 2006 Guidelines: strong opinion of futility
Myoclonus

- **Post-Hypoxic myoclonus (PHM)**
  - Abrupt, irregular contractions of muscles
  - Focal / Generalised
  - Stimulation
  - Acute < 48hrs
  - Chronic – days to weeks
  - Refractory

- **Lance Adams Syndrome**
  - Myoclonus (intention) in pts who have regained consciousness

- **Myoclonic Status Epilepticus (MSE)**
  - Acute PHM > 30mins (not epilepsy)
2532 Cardiac Arrest survivors 2002-2012

Retrospective series

19% had Myoclonus (471pts)

9% Survived to hospital discharge with CPC 1-2 (minor to moderate neurological disability)

Withdrawal of Rx in 78% median 5 days
Confounding factors

• Therapeutic hypothermia
• Time of assessment
• Metabolic derrangements
• Shock
• Organ failure
• Sedatives
Role of imaging

- Diffuse swelling on CT common
- Predictive power of CT not known entirely
- MRI / PET ?? future role
Other interventions

- Neurone specific enolase (>33mcg/l = poor)
- SSEP = bilateral absence of n20 median nerve
- EEG = burst suppression / generalised seizures
In my practice . . .

- Initial ABC Stabilisation
- Assess / Treat cause (coronary angio / CTB / CTPA / TTE)
- 24hrs TTM @ 36C
- Sedate Propofol / Remi / Paralysis
- 48hrs passive rewarm to 37C ICU supportive treatment for 96hrs
- Neurological assessment +/- 1x
In my practice, bad prognostic signs ...

At 96hrs

• Persisting coma & Motor score < 2 off sedation > 12 hours
• Refractory status despite AED + benzo/prop

Before 96hrs

• Brain death
• Myoclonus (… ? Most likely)
• Refractory shock / MOF (Unsupportable)
• Disseminated malignancy / other end-stage dx
Conclusions

• Use best evidence you have to determine prognosis
• Give odds not absolute statements / spectrum of outcome
• Note modifying effects of hypothermia
• Combine variables rather than one predictor
• When in doubt … give more time
Thank you